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RELATIONSHIPS BETWEEN ELECTROKINETIC INDEX OF BUCCAL EPITHELIUM AND SOME FUNCTIONAL AND METABOLIC PARAMETERS AT MEN WITH CHRONIC PYELONEPHRITE

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Abstracts

Background. Known for a number of parameters of the body, which through regression equations derived can assess biological age. We examined relationships between electrokinetic mobility buccal epithelium cell nuclei, named Electrokinetic Index (EKI), and some functional and metabolic parameters of body. **Methods.** Under a observations were 23 men by age 24-70 years with chronic pyelonephrite in the phase of remission. We estimated the EKI, state of the vegetative and hormonal regulation as well as metabolism of cholesterol. **Results.** We confirned closely correlation (r=-0,89) between Metric Age and EKI. Baevskiy's Adaptation Potential and Stange's Test together determines EKI on 28%. RMSSD, VLF and Baevskiy's Stress Index determines EKI on 31%. Plasma Colesterol and Klimov's Atherogenicity Coefficient determines EKI on 56%. In summary model of multiple regression with stepwise excluding are currently two last parameters as well as Plasma Testosterone and relative Power Spectral VLF HRV, which together determines EKI on 73%: R=0,868; R^2=0,754; Adjusted R^2=0,730;$F_{(4,4)}$=31,4; $\chi^2_{(4)}$=58,9; $p<10^{-5}$. **Conclusion.** Electrokinetic Index of buccal epithelium really rellects neuro-endocrine regulation and metabolism of Cholesterol.

Keywords: Electrokinetic Index, Biological Age, HRV, Cholesterol, Testosterone, Cortisol, Relationships.

INTRODUCTION

Biological age is considered a basic component of occupational health, which has a close relationship with clinical and professional longevity. In terms of biological age are known to age-related changes specific physiological systems of the body are compared to the average population parameters. Sensing the changes in the human body "after the fact", the concept of biological age is limited prognostic capabilities, but on the basis of possible development of correction most likely or those that have already occurred, adverse changes in human account of the maximum number of factors that affect his health. So, definition of biological age can be an example of general biological ("gerontologic") pre- and no-nozological diagnosis. According to the dynamics of biological age to judge the effect on integratedbody as unfavorable and rehabilitation [10].

Known for a number of parameters of the body, which through regression equations derived can assess biological age. These are clearly subordinate to age-related changes include: body mass index, body fat content, dry weight, basal metabolism, vital capacity and maximum ventilation, minute volume of blood pulse wave velocity distribution in the arteries, blood pressure, force muscles, maximal oxygen uptake, the state of the neuro-muscular system and sense organs, urinary excretion of 17-ketosteroids, glomerular filtration rate of creatinine and urea, blood levels of triglycerides, cholesterol, glucose, urea, ALT, salivary secretory activity of the stomach glands, electrokinetic mobility buccal epithelium cell nuclei, etc. [cited by: 10].

We chose it at the last marker of biological age, which is the basis of the device "Biotest". According to the authors [4,8,9], electrophoretic mobility of cell nuclei of animals naturally varies under various external influences, including decreases under high temperature, UV exposure and inhibitors of protein synthesis and nucleic acids, while under the influence of stimulants increased biosynthesis. In human cell nuclei electrokinetic mobility buccal epithelium (named as Electrokinetic Index) almost linearly decreases with aging. However, it is reduced to a state of fatigue in different diseases, and reduction measure associated with severity of disease and successful treatment at this rate is reduced to a level typical for this age group. We were very impressed that when the device patenting his main purpose was stated rapid testing efficiency rehabilitation of human health, particularly in resort.

MATERIALS AND METHODS

Under a observations were 23 men by age 24-70 years with chronic pyelonephrite in the phase of remission. At a receipt, first they determine the rate of electronegative nuclei of buccal epithelium by intracellular microelectrophoresis on the device "Biotest" (Kharkov State University), according to the method described [4,8]. Then estimated the state of the vegetative regulation by the method heart rate variability (HRV) [1,3], using a hardwarily-programmatic complex "КардіоЛаб+ВСР" ("ХАІ-МЕДИКА", Харків). At last determined content in plasma of blood Cortisol, Testosterone and Triiodo-thyronine (by the ELISA method with the use of analyzer "Tecan" from Oesterreich and corresponding sets of reagents from ООО "Алкор Био", СПб, РФ); lipide spectrum of plasma: total cholesterol (by a direct method after the classic reaction by Zlatkis-Zack) and content of him in composition of α-lipoproteins (by the enzyme method after precipitation of notα-lipoproteins); prae-β-lipoproteins (expected by the level of triacylglycerides, by a certain meta-periodate method); β-lipoproteins (expected by a difference

between a total cholesterol and cholesterol in composition α-and prae-β-lipoproteins) according to instructions [2] with the use of analyzers "Reflotron" (BRD) and "Pointe-180" (USA) and corresponding sets of reagents. In addition used routine Stange's and Hench's Tests and calculated Baevskiy Adaptation Potential. After 9-11 days all testes repeated.

For statistical analysis applied doubles, regression and canonical correlation analysis using the software package "Statistica 5.5" [5].

RESULTS AND DISCUSSION

First of all we confirned closely correlation between Metric Age and Electrokinetic Index (Fig. 1).

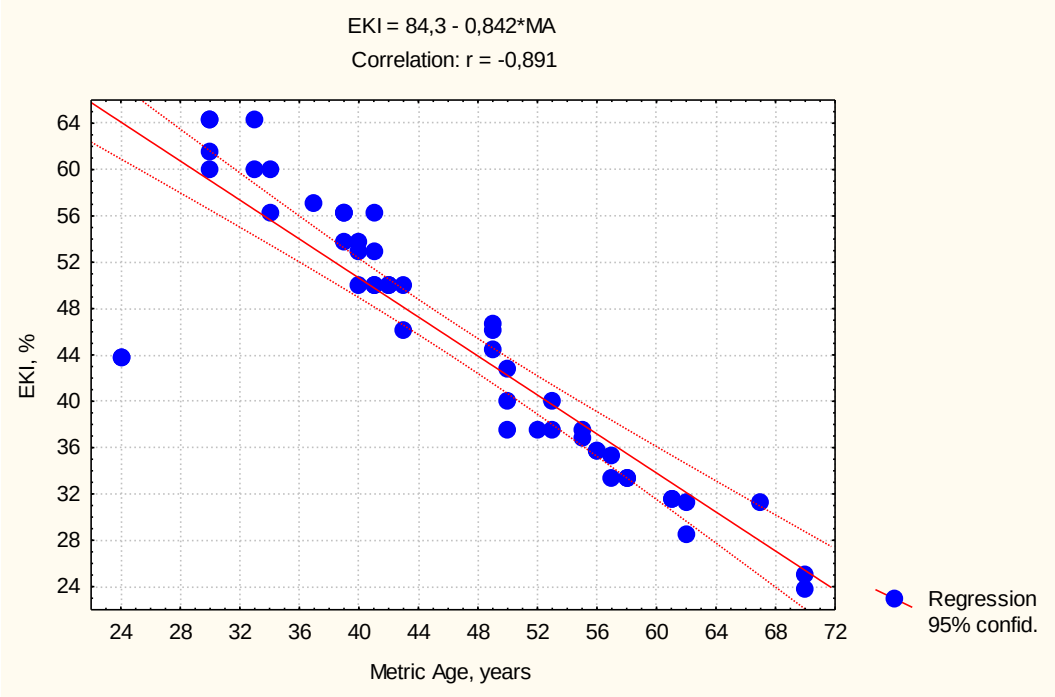

Fig. 1. Correlation between Metric Age (axis X) and Electrokinetic Index (axis Y)

It is detected that Biological Age is more or less than Metric Age (Fig. 2).

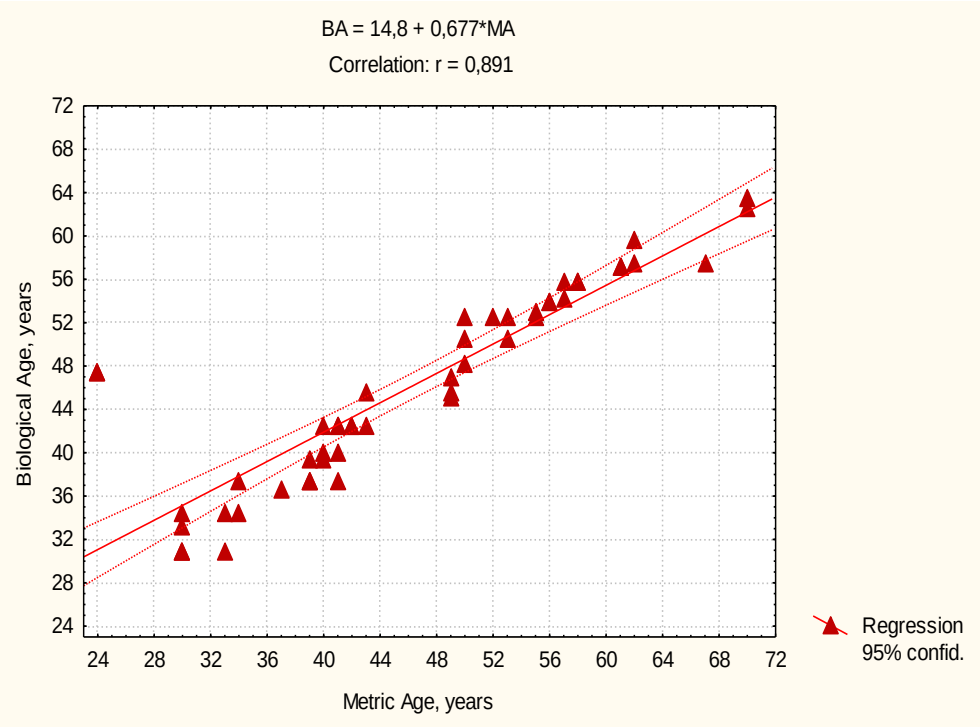

Fig. 2. Correlation between Metric Age (axis X) and Biological Age (axis Y)

Detected moderately negatively correlation (Fig. 3) between Biological Age and Baevskiy's Adaptation Potential, for calculation of which used Metric Age, Body Weight, Height, Heart Rate and Blood Pressure.

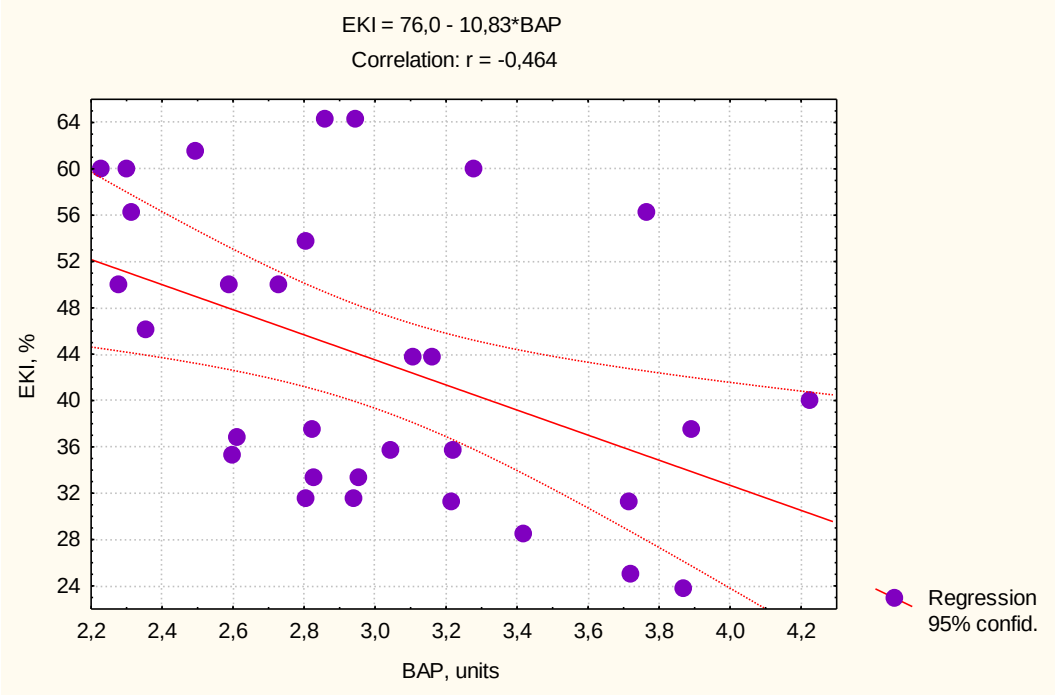

Fig. 3. Correlation between Baevskiy's Adaptation Potential (axis X) and Electrokinetic Index (axis Y)

However correlation between Electrokinetic Index and Stange's Test is positively (Fig. 4).

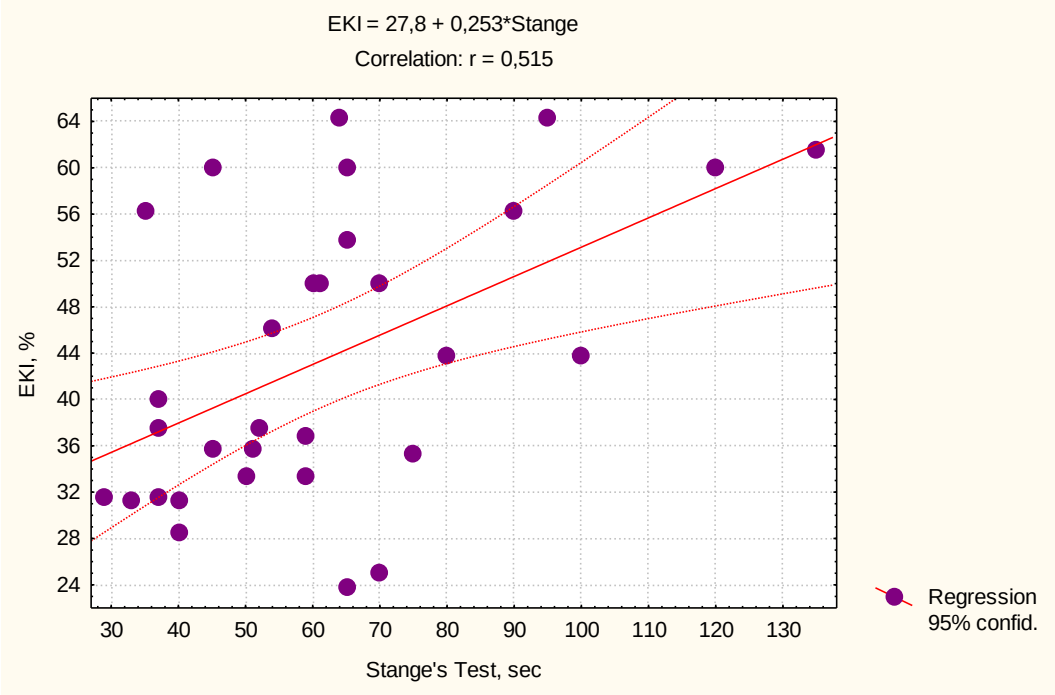

Fig. 4. Correlation between Stange's Test (axis X) and Electrokinetic Index (axis Y)

Two parameters together determines Electrokinetic Index on 28% (Table 1, Fig. 5)

Table 1. Regression Summary for Dependent Variable: EKI

R=0,573; R^2=0,329; Adjusted R^2=0,281; $F_{(2,2)}$=6,85; p=,004; Std. Error of estimate: 10,5%

	Beta	St. Err. of Beta	B	St. Err. of B	$t_{(28)}$	p-level
Intercpt			51,84	15,64	3,31	0,003
Stange's Test	0,381	0,175	0,19	0,09	2,17	0,038
Baevskiy's AP	-0,285	0,175	-6,64	4,09	-1,62	0,116

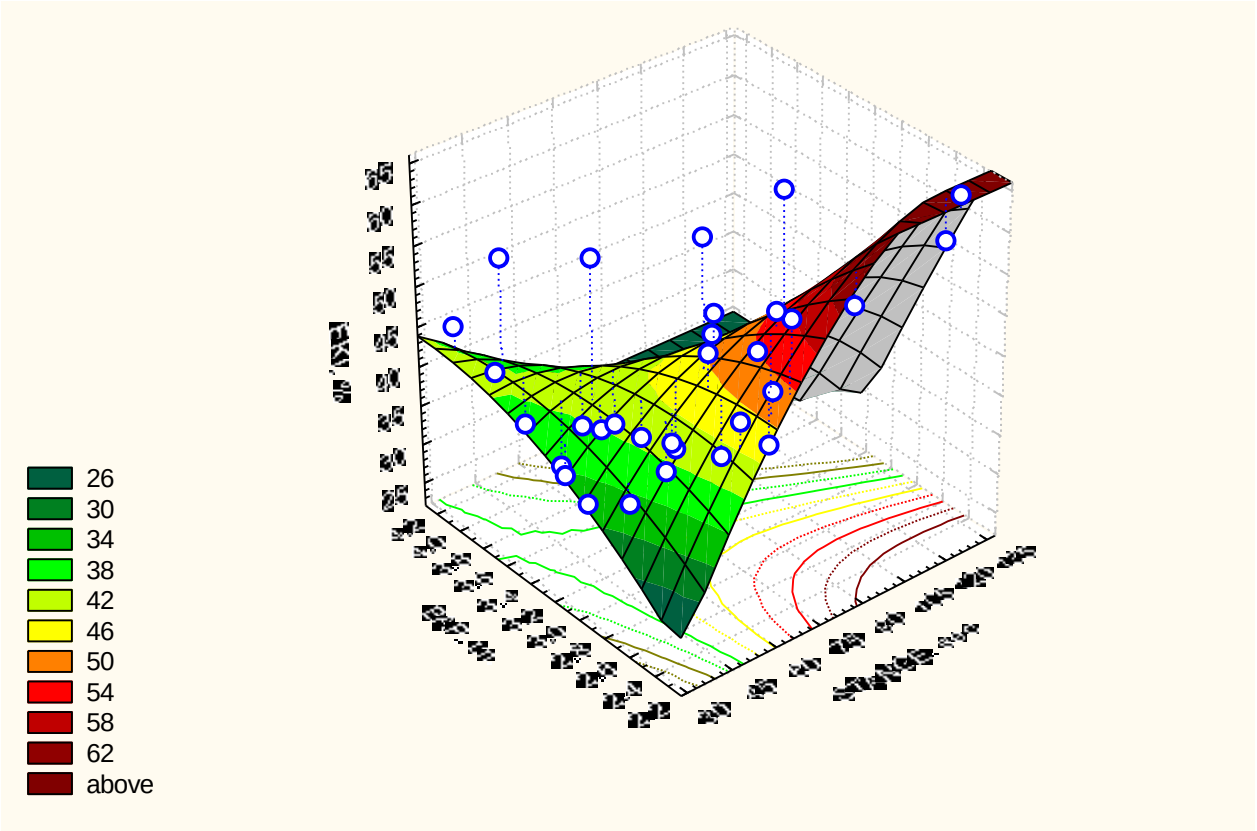

Fig. 5. Correlation between Stange's Test (axis X), Baevskiy Adaptation Potential (axis Y) and Electrokinetic Index (axis Z)

Among parameters HRV strongest directly correlates with Electrokinetic Index markers of vagal tone RMSSD (Fig. 6), HF (r=0,45), SDNN (r=0,43), DX (r=0,36), however inversely with markers of sympathetic tone AMo (r=-0,44), Baevskiy's Stress Index (r=-0,41) and relative PS VLF HRV (r=-0,38).

RMSSD and VLF determines Electrokinetic Index on 31% (Fig. 7, Table 2), and together with Baevskiy's Stress Index measure of determination increasing to 33% (Table 3, Fig. 8).

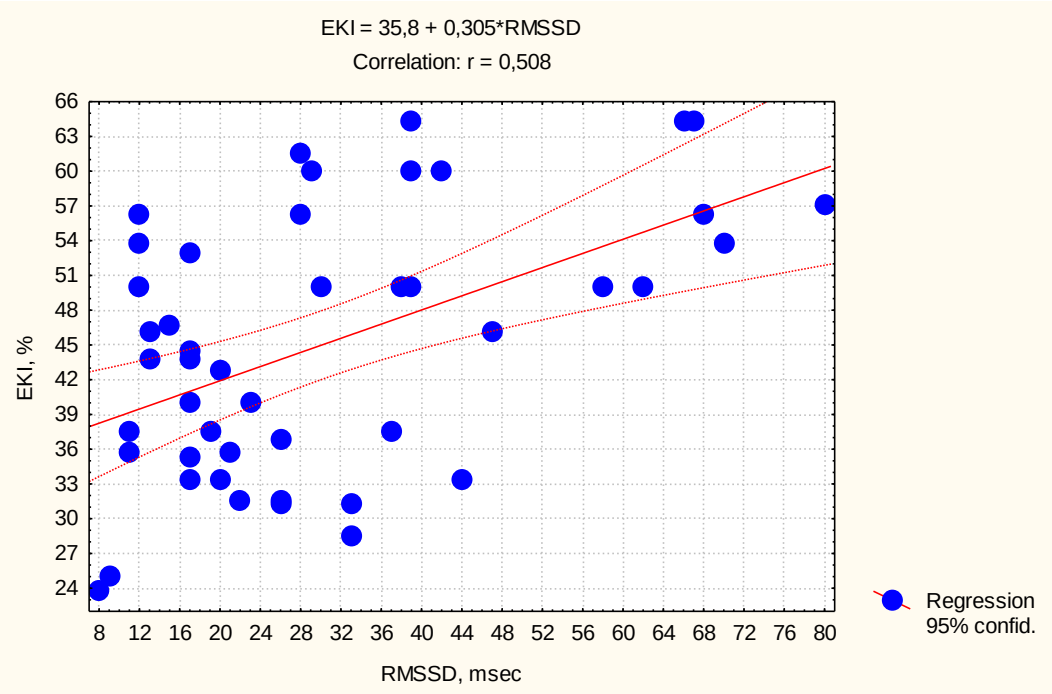

Fig. 6. Correlation between RMSSD (axis X) and Electrokinetic Index (axis Y)

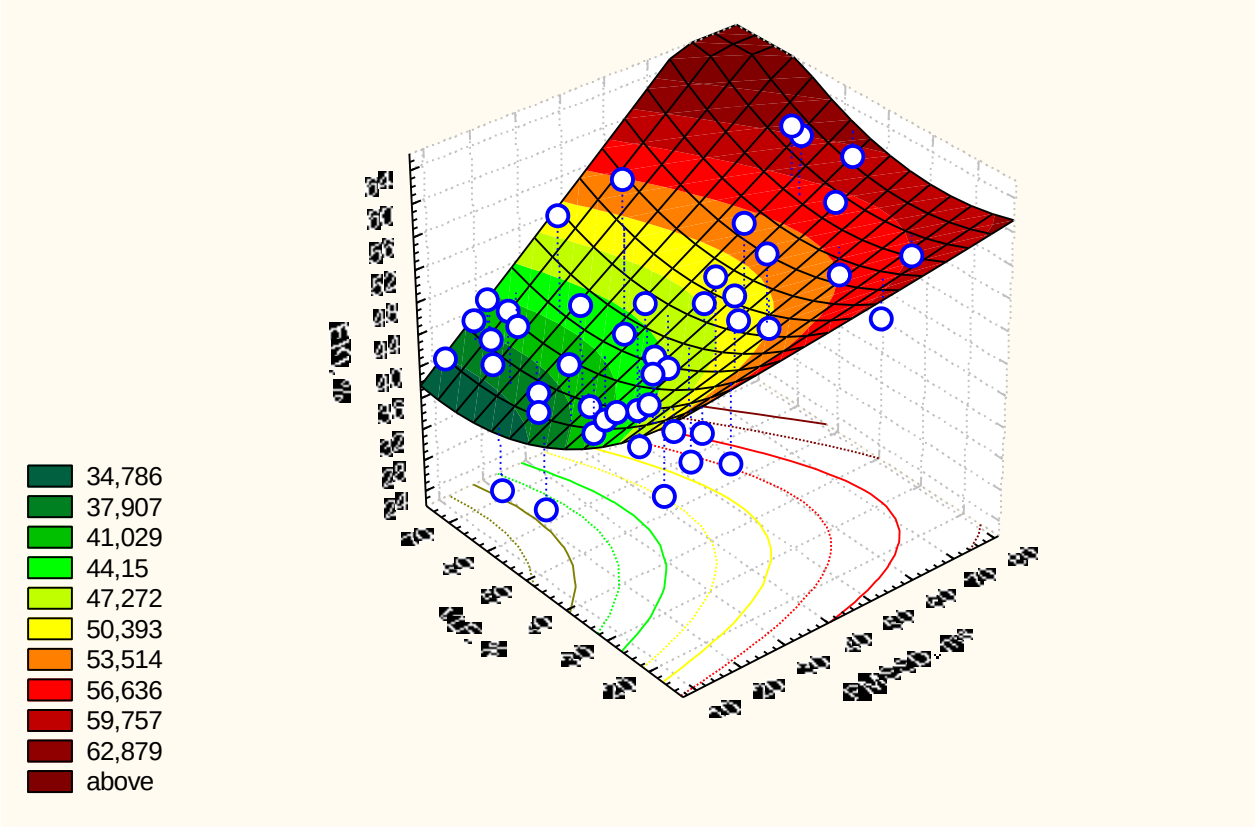

Fig. 7. Correlation between RMSSD (axis X), PS VLF (axis Y) and Electrokinetic Index (axis Z)

Table 2. Regression Summary for Dependent Variable: EKI

R=0,585; R^2=0,343; Adjusted R^2=0,312; $F_{(2,4)}$=11,2; p=10^{-4}; Std. Error of estimate: 9,4%

	Beta	St. Err. of Beta	B	St. Err. of B	$t_{(43)}$	p-level
Intercpt			45,52	4,91	9,28	10^{-6}
RMSSD	0,455	0,126	0,273	0,076	3,62	10^{-3}
VLF%	-0,296	0,126	-0,199	0,085	-2,35	0,023

Table 3. Regression Summary for Dependent Variable: EKI

R=0,612; R^2=0,374; Adjusted R^2=0,329; $F_{(3,4)}$=8,4; $\chi^2_{(3)}$=19,9; p<10^{-3}; Std.Error of estimate:9,3%

	Beta	St. Err. of Beta	B	St. Err. of B	$t_{(42)}$	p-level
Intercpt			53,0	7,1	7,49	10^{-6}
RMSSD	0,296	0,166	0,178	0,100	1,78	0,08
VLF%	-0,338	0,127	-0,227	0,086	-2,65	0,01
Stress Index	-0,237	0,163	-0,018	0,012	-1,45	0,15

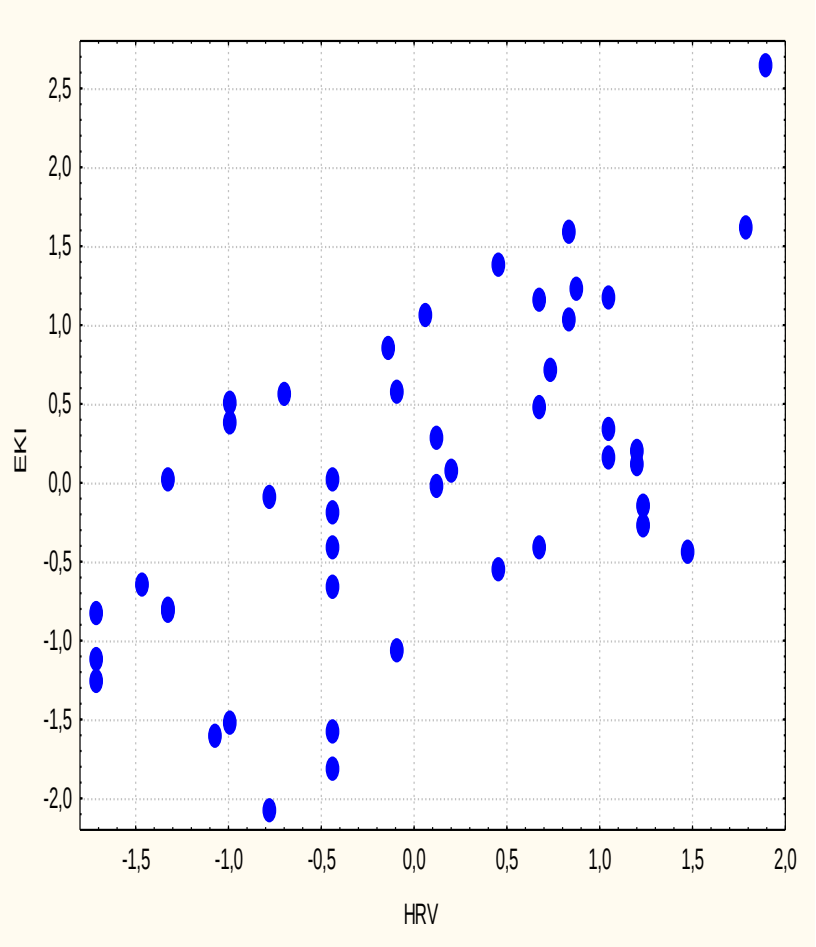

Fig. 8. Canonical correlation between parameters of HRV (axis X) and Electrokinetic Index (axis Y)

Completely expected was found negativelycorrelation Electrokinetic Index with Plasma Colesterol (Fig. 9) as well as Klimov's Atherogenicity Coefficient (Fig. 10), which together determines its on 56% (Table 4, Fig. 11).

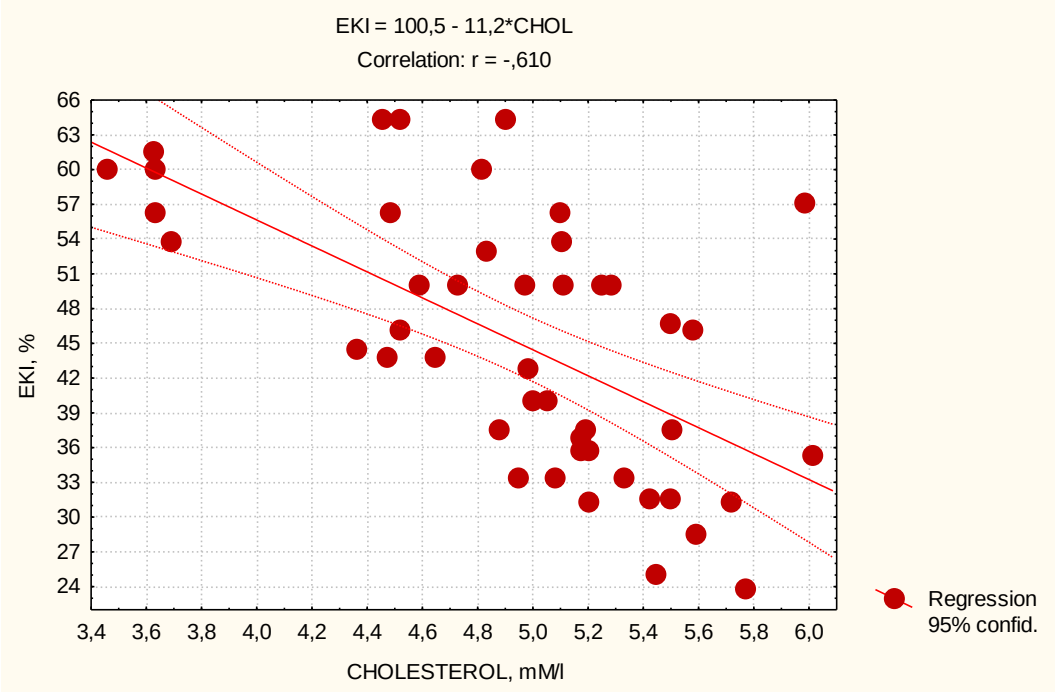

Fig. 9. Correlation between Plasma Cholesterol (axis X) and Electrokinetic Index (axis Y)

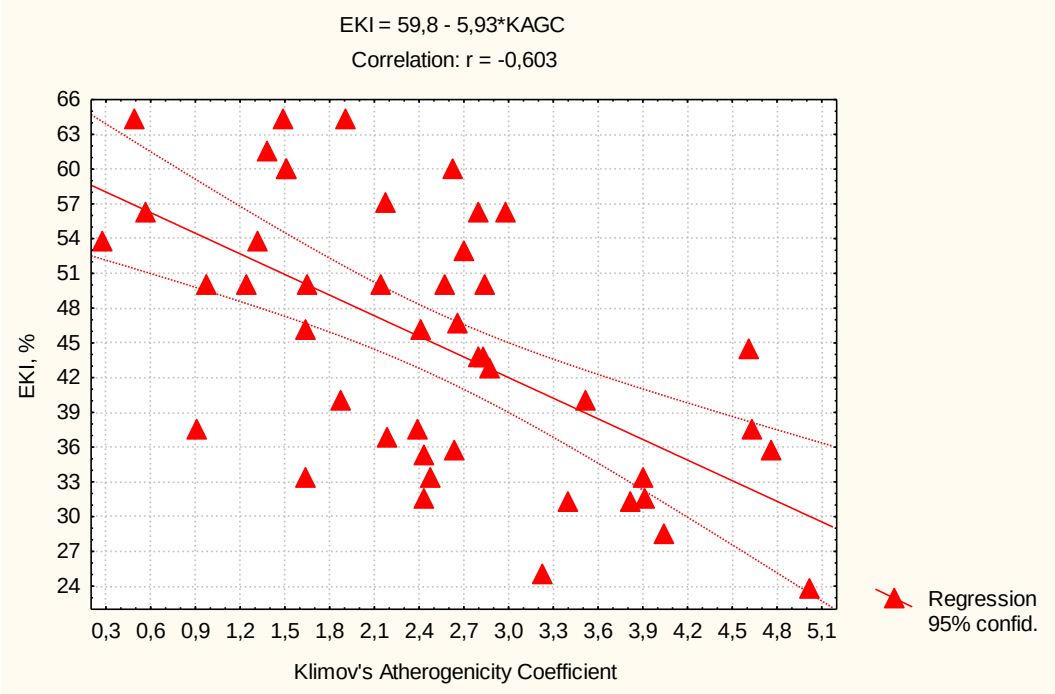

Fig. 10. Correlation between Klimov's Atherogenicity Coefficient (axis X) and Electrokinetic Index (axis Y)

Table 4. Regression Summary for Dependent Variable: EKI

R=0,761; R^2=0,580; Adjusted R^2=0,560; $F_{(2,4)}$=29,6; $p<10^{-6}$; Std. Error of estimate: 7,5%

	Beta	St. Err. of Beta	B	St. Err. of B	$t_{(43)}$	p-level
Intercpt			100,45	9,05	11,1	10^{-6}
Cholesterol	-0,482	0,103	-8,865	1,887	-4,70	10^{-4}
KAGC	-0,473	0,103	-4,654	1,010	-4,61	10^{-4}

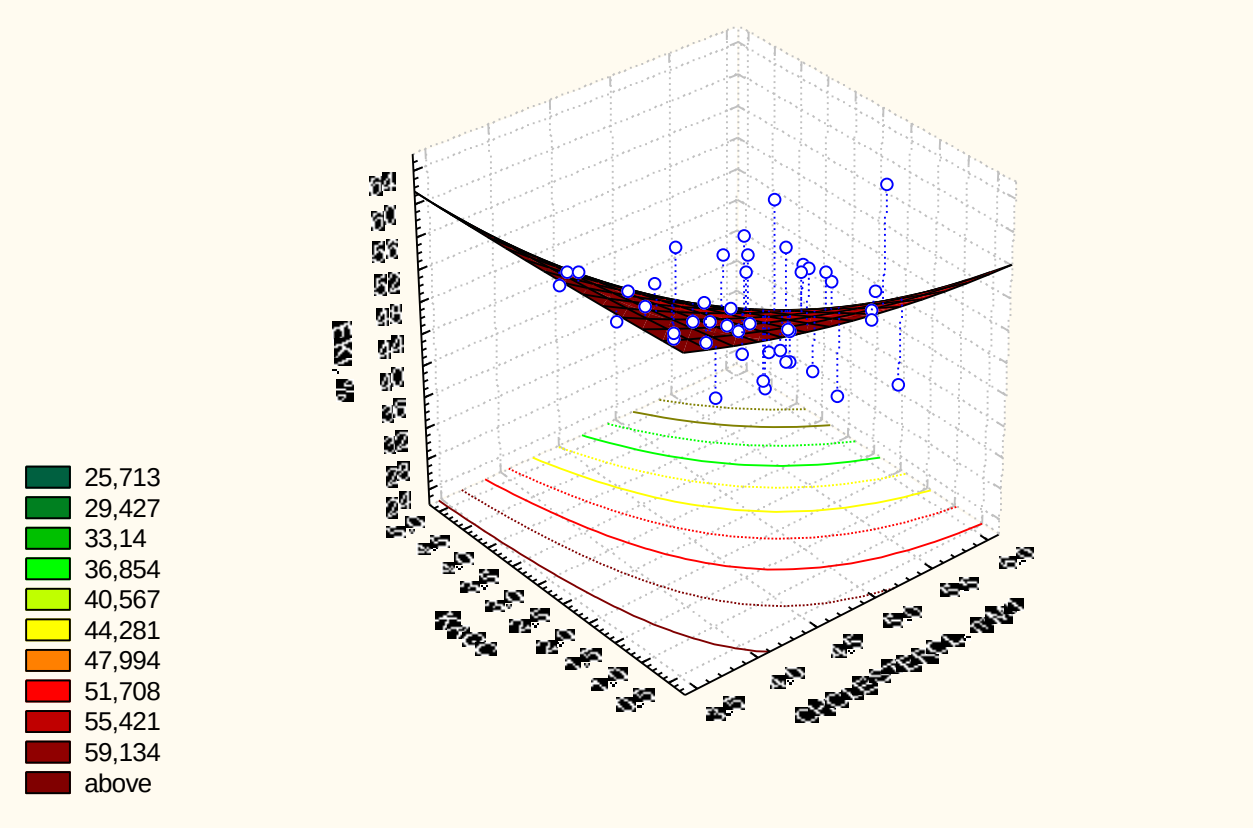

Fig. 11. Correlation between Plasma Colesterol (axis X), Klimov's Atherogenicity Coefficient (axis Y) and Electrokinetic Index (axis Z)

However Plasma Testosterone (Fig. 12) and Cortisol (Fig. 13) (but not Triiode-thyronin) determines Electrokinetic Index positively.

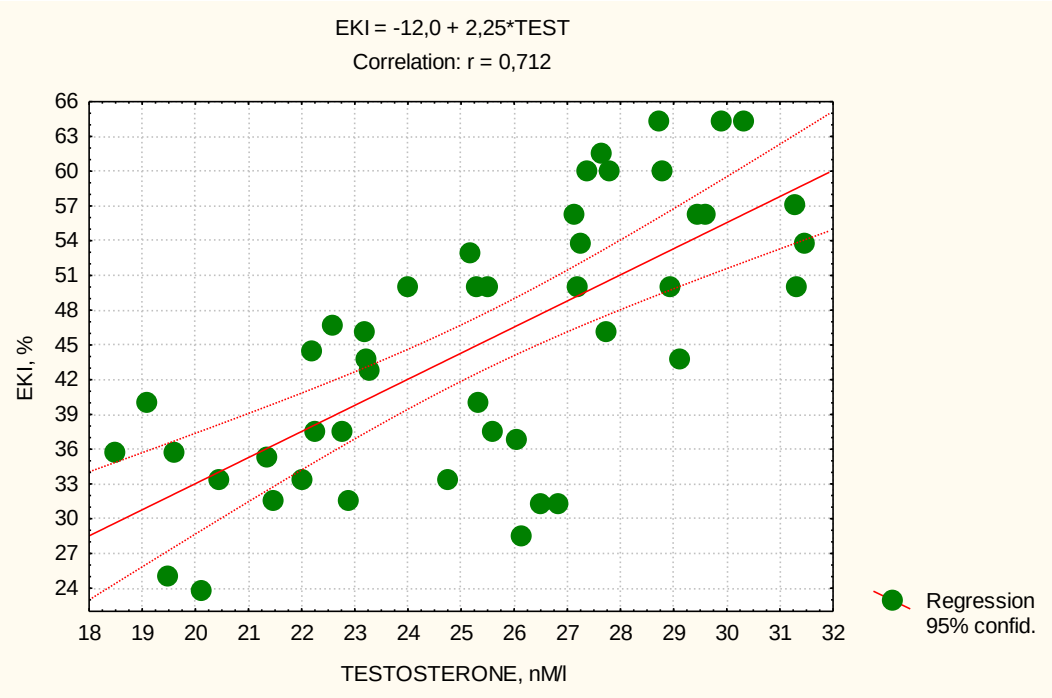

Fig. 12. Correlation between Plasma Testosterone (axis X) and Electrokinetic Index (axis Y)

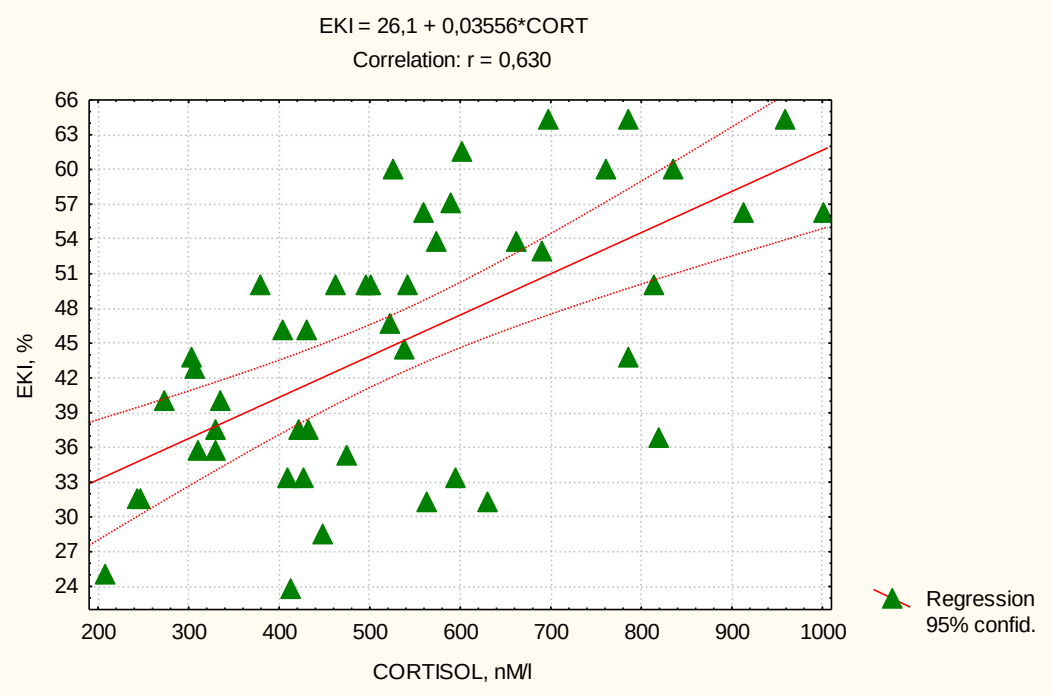

Fig. 13. Correlation between Plasma Cortisol (axis X) and Electrokinetic Index (axis Y)

In summary model of multiple regression with stepwise excluding are currently two last parameters as well as Plasma Testosterone and relative Power Spectral VLF HRV, which together determines EKI on 73% (Table 5, Fig. 14).

Table 5. Regression Summary for Dependent Variable: EKI

R=0,868; R^2=0,754; Adjusted R^2=0,730;$F_{(4,4)}$=31,4; $\chi^2_{(4)}$=58,9; $p<10^{-5}$; St. Err. of estimate: 5,9%

	Beta	St. Err. of Beta	B	St. Err. of B	$t_{(41)}$	p-level
Intercpt			36,8	13,8	2,66	0,011
Testosterone	0,573	0,108	1,816	0,341	5,33	10^{-5}
Cholesterole	-0,410	0,087	-7,525	1,604	-4,69	10^{-4}
Klimov's AGC	-0,306	0,087	-3,013	0,853	-3,53	0,001
PS VLF	0,235	0,103	0,158	0,070	2,27	0,028

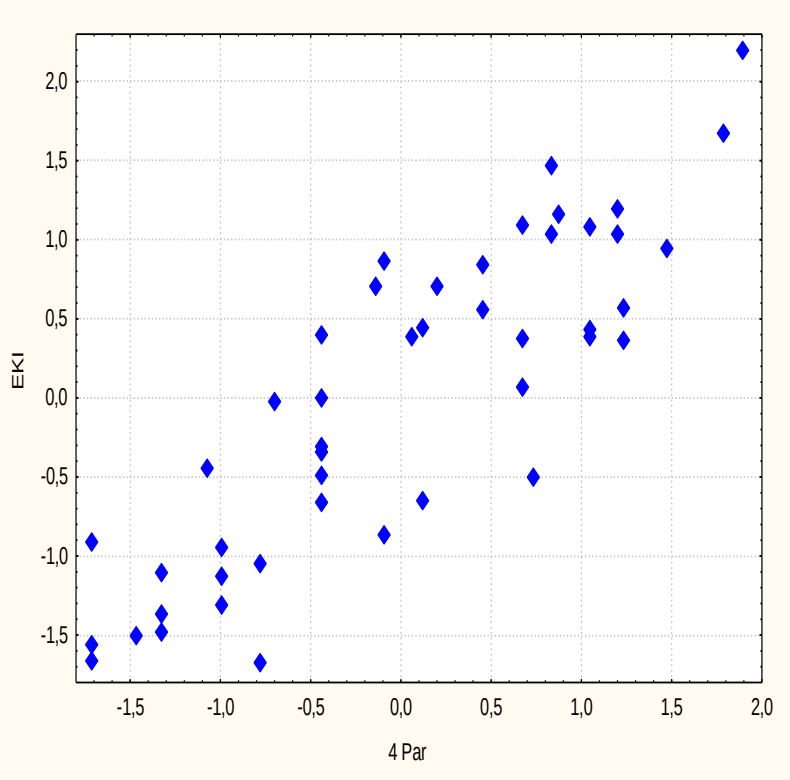

Fig. 14. Canonical correlation between neuro-endocrine and metabolic parameters (axis X) and Electrokinetic Index (axis Y)

Thus, Electrokinetic Index of buccal epithelium really rellects neuro-endocrine regulation and metabolism of Cholesterol.

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